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DRAFT

POLAR RESEARCH IN GEOPHYSICS OF THE SOLID EARTH

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Part I

Altogether, the 19 universities show a total of 20 professional level department members now active in polar work, with 42 others on this level who could participate in the work if given the opportunity. An average of 3½% of graduate students in these departments have done or are now doing polar research.

Part II

1. Only 25% of the departments reporting have special equipment for polar research; these include:

Columbia - airborne magnetometer, proton precession magnetometer, earthquake seismographs, portable seismic equipment, portable gravity equipment, microbarovariograph, precision depth recorder, thermograds (heat conduction equipment) electric-resistivity equipment, radiocarbon and other radioactive dating facilities for geochemical and petrographic analysis.

Wisconsin - (seismic equipment) long refraction, short refraction, reflection. (gravity equipment) pendulums, gravimeters. (magnetometers, total field) continuous recording, spot recording, vertical

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component, horizontal component, sun compasses, dip needles. Electrical resistivity equipment, geiger counters, altimeters. (the above excludes equipment now in use in the Antarctic)

Ohio State - Worden gravimeter, A-7 plotter for photogrammetry.

Mich - cold room, etc

Cal. Tech. - Portable seismic equipment, earthquake seismographs, gravity meter.

M. I. T. - Facilities for age determination of rocks.

2. Two of the departments reporting (10%), Columbia and Wisconsin, maintain separate polar libraries, as well as a departmental library which keeps most classical and present polar books. About 40% more rely on their general library, which keeps the usual publications in this field. 30% have very limited polar library facilities, and 20% have none.

3. Only 10% have special collections; these are Columbia and the University of Wisconsin, with the following:

Columbia - seismic refraction and reflection records, seismograms, copies of all geophysical data taken from Stations Alpha and Charlie and most of such for T-3.

Wisconsin - data reduction and analysis center files containing all position, elevation, seismic, gravity and magnetic raw data and reduced data

taken in Antarctica and most of such data taken in the Arctic since 1948.

Part III

1. The only university reporting which offers a course dealing primarily with polar problems is the University of Wisconsin, which offers a seminar every other year conducted by Dr. Charles Bentley. The average enrollment is 12 graduate students and 3 undergraduate students. No expansion of courses in this field is planned. Dr. Woollard's comment on this is, in substance, that the polar regions constitute just two areas of the earth's surface which are not unique from a geophysical standpoint, except that they offer advantages for certain investigations on the earth's interior and crustal strength. He does not feel that outside of the study of glaciology as such, specific courses on polar regions are justified.

2. No other departments reporting contemplate polar courses in the future.

3. According to the questionnaires, only two geophysics departments report having students theses which related to polar areas in the past five years. Both Columbia and the University of Colorado had one student who dealt with this subject matter in his Ph. D. thesis.

4. At present, 20% of the departments have such theses underway, Columbia has one at the Ph. D. level, Wisconsin two, California Institute of Technology one, and the University of Colorado one for the Master's degree.

5. About 25% of the departments have students who have had previous polar experience, making a total of 22 18 students. The IGY provided for 55% of these, and practically all the rest had participated in government sponsored expeditions. Only one student had participated in a privately sponsored expedition.

Part IV

1. 16 20% of the departments had polar research projects currently underway:

Columbia - At Station Charley the geophysicists are were carrying on a broad program in seismology, marine geology, geophysics and magnetics; at Cape Hallet, earthquake and at T-3, a refraction program. The source of funds for these projects is the IGY-IGC. At Lamont, data reductions are going forward for all of stations Charley and Alpha. The above operations are scheduled to run for one year, with logistic support by the U.S. Air Force and the U.S. Navy.

Wisconsin - Antarctic crustal studies are being

carried on by traverse operations on the ground and by air lift, as well as studies of ice accretion rate and foreign base interconnections in gravity. In the Arctic shelf area, gravity and magnetic studies are going forward. The department maintains a seismic, gravity and magnetic data reduction center, as well as a center for translations of foreign literature. The above projects are supported by the National Science Foundation with logistic support by the U.S. Air Force and Navy. They are scheduled to run for two years.

Cal. Tech. - Is carrying on seismological studies at the Wilkes Seismograph Station. This project is supported by the IGY and scheduled to run for three years.

M. I. T. - Has a world-wide age correlation project under Professor Patrick Hurley, which would include the polar areas. It has no outside support.

Michigan - Proj completed

2. Only about 10% reported polar work completed within the last 5 years:

Wisconsin - A regional gravity study of Alaska including some magnetic work and studies of crustal thickness and composition were completed. Gravity connections to ice islands Alpha and Bravo in the Arctic Ocean were made. In Antarctica gravity, magnetic,

structural, seismic and seismic refraction studies were made. Logistic support was satisfactory.

Columbia - At Station Alpha, Columbia geophysicists carried out a broad program of marine geophysics, seismology, magnetics, gravity and marine geology. This work ran from April, 1957 to November, 1958, and was supported by the U.S. Air Force. Logistic support was satisfactory.

Michigan - seismic refraction studies

3. Both universities expect to continue geophysical work in the polar areas. Their plans for the next two years are as follows:

Wisconsin - Continuation of ground and airborne gravity, seismic and gravity traverses. Continuation of isotope studies (of Antarctic ice) accretion, crustal, paleomagnetic studies, and continental shelf studies around Antarctica.

Columbia - Continuation of the marine geophysics at Station T-3. No particular deficiencies were listed (in personnel, funds, support, etc.).

4. On the question concerning present deficiencies, the Columbia questionnaire stated that it would be most useful if spot landings on the ice by air craft could be arranged.

Summary

In a field of 19 universities reporting*, polar activities

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* This whole picture is obscured by the fact that Dartmouth and the University of Washington, both active in this field, have not reported as yet. Several other departments reporting give almost no statistics, saying that they are not the logical recipients for this questionnaire.

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are largely concentrated in two, Columbia University and the University of Wisconsin. A few others show sporadic research activities or possess one or two staff members having polar experience. Several smaller universities with no previous activities in this field show an interest in it and readiness to undertake studies, if they had support.

In the questionnaire on equipment, Ohio State lists several instruments which could be used in polar research, as well as for general studies, although this is not being done at present. 50% reporting had a poor polar library collection or none at all. It is possible that if more information were available to staff members and students, more interest in this area would be created.

It is interesting that in the one university whose geophysics department offers a course dealing with polar research, the University of Wisconsin, the department head entered a statement on the limited usefulness of specific courses in this field. None of the others questioned were planning polar courses in the future.

In all departments polled, a total of 19 [22] students have had some polar experience. The majority of these had worked on IGY programs and all but one had depended on government sponsored programs of some sort.

Only two institutions, Columbia and Wisconsin, are carrying out polar research on a large scale, Columbia with support from the IGY-IGC and Wisconsin with support from the National Science Foundation. Cal. Tech. is running a seismograph station, supported by the IGY. Wisconsin and Columbia receive logistical support from the Air Force and Navy, and find it very satisfactory.

Columbia scientists suggested that future investigations would be greatly helped by having facilities for spot landings on the ice by aircraft. Otherwise, no specific needs were listed by either institution.

Maurice Ewing
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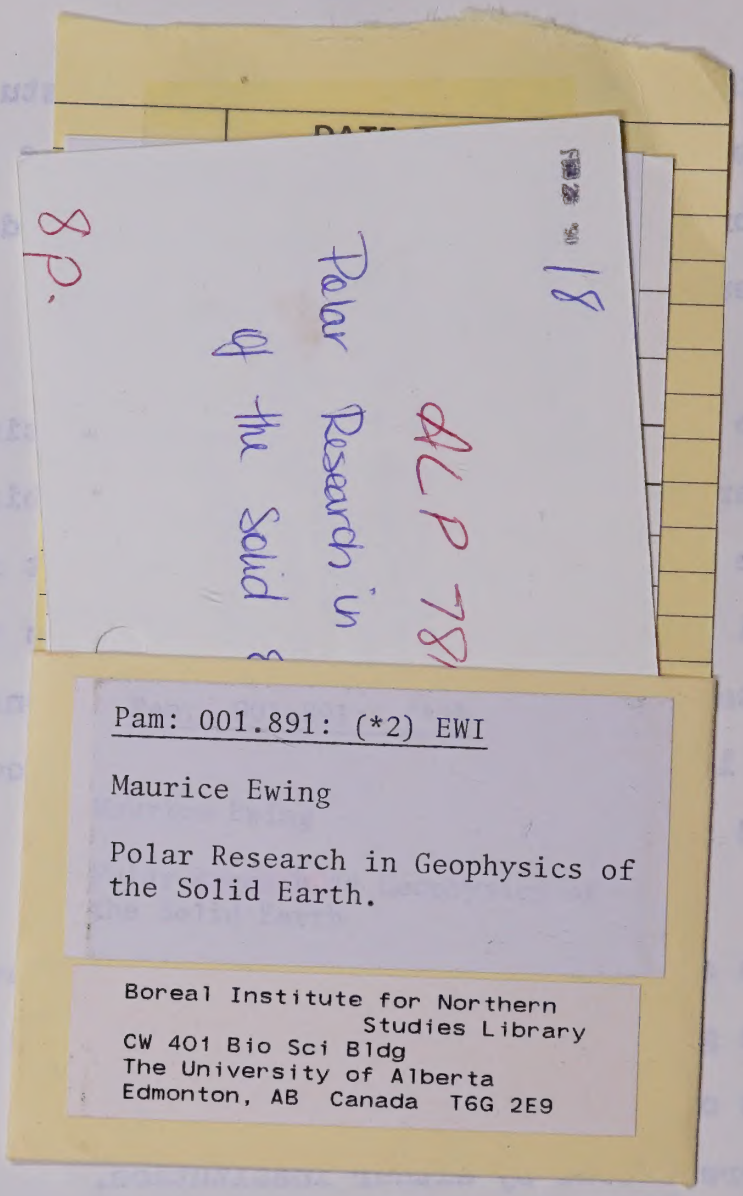

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Polar Research in Geophysics of the Solid Earth.

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